A NOVEL H.264 SVC ENCRYPTION SCHEME FOR SECURE BIT-RATE TRANSCODING

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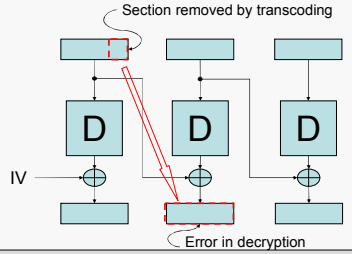
1 ABSTRACT

Motivation:

- *Traditional encryption causes errors if transcoding is carried out*
- *ECB mode encryption not secure*
- *Adding additional data to preserve synchronization increases bitrate*



Features:

- *No Decryption required prior to scaling*
- *Any standard cipher can be used*
- *Supports all types of scalability*

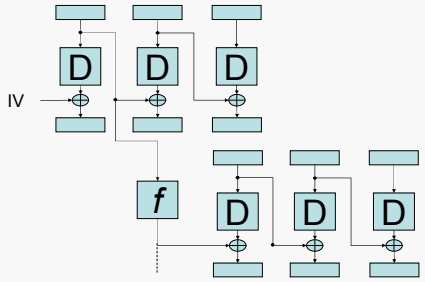
Benefits:

- *End to end security preserved*
- *Highest level of security using well studied ciphers*
- *No bitrate overhead*
- *Compatible with standard scaling transcoders*

2 SVE ARCHITECTURE

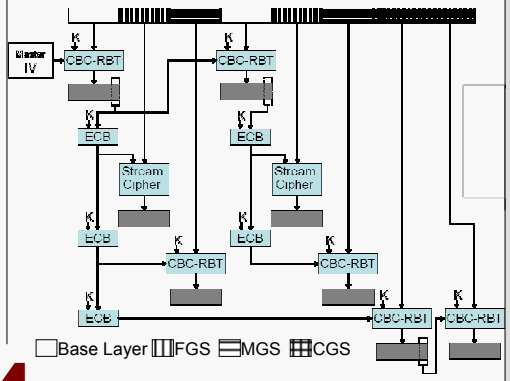
Cipher Block Tree (CBT):

- *Novel mode of operation*
- *Allows several CBC chains to be connected in a tree structure*
- *Only one key and IV required to support a tree*
- *IV for a chain created using a function, f, on output of block from parent chain*



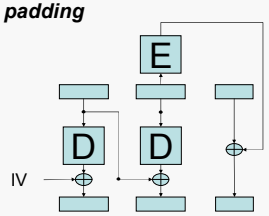
SVE:

- *Derived from CBT for use with SVC*
- *Support for potential future support of FGS*
- *Uses Residual Block Termination (RBT) to avoid bitrate expansion due to padding*



Residual Block Termination (RBT):

- *Standard technique used in block ciphers*
- *Used to encrypt last block if size of plaintext is not multiple of block size*
- *Avoids bitrate expansion caused by padding*



3 RESULTS

Security:

- *High level of security*
- *No weaknesses from IV reuse*
- *No weaknesses from use of ECB*
- *NAL headers unencrypted so some information leaked*

Transcoder Latency:

- *No latency added by encryption*
- *Packets can be transcoded independently despite encryption*

Transcoding Flexibility:

- *All forms of bitrate scaling supported*
- *Bit level transcoding using FGS is possible*
- *No effect on the quality of output due to encryption*

Bitrate Overhead:

- *Does not add any significant overhead*
- *Only one key and IV need to be transmitted*
- *Padding avoided by use of RBT*

4 CONCLUSIONS

- *An encryption scheme optimised for use with SVC*
- *Can be modified for use with other scalable media*
- *Can support FGS scalability*
- *Encryption transparent to transcoder*
- *High levels of security possible*
- *Benefits of scalable coding preserved*
- *No compromise on codec performance*